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USDA FOREST SERVICE RESEARCH NOTE

PNW-254 September 1975

RELATIONSHIP OF ROOT LENGTH TO STEM DIAMETER IN CURLLEAF MOUNTAIN-MAHOGANY

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FOREST AND RANGE
ERIMENT STATION
FEB 20 1976
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ABSTRACT

Measurements of root lengths and stem diameters were taken on 24 curlleaf mountain-mahogany seedlings 112 days after germination. Plants with the longest root systems possessed the largest stem diameters, indicating general plant vigor. Selection of seedlings with larger stem diameters for use in outplanting or research may increase rate of survival.

KEYWORDS: Curlleaf mountain-mahogany, *Cercocarpus ledifolius*, root system -)outplanting, stem diameter.

INTRODUCTION

Curlleaf mountain-mahogany (*Cercocarpus ledifolius*) is a small, evergreen hardwood tree (shrub form in portions of its range) which commonly grows on high mountain slopes and scattered rocky outcroppings from the west slope of the Rocky Mountains to the Cascade Range. It is found extensively at the lower edge of the ponderosa pine (*Pinus ponderosa* Laws.) forests and within the conifer zone on shallow, rocky soils (Dealy 1975).

Because of extensive use by big game for cover and forage, curlleaf mountain-mahogany is recognized as an important and desirable range species (Brandborg 1955, Kufeld 1973, Reynolds [n.d.], Smith 1954). New techniques for propagation of seedlings and new methods of outplanting are in demand by managers and nurserymen. Selection of the strongest seedlings in nursery bed

stock is important to insure survival after outplanting. Survival of mountain-mahogany seedlings, as with other desert trees and shrubs, depends partially on a deep, well-developed root system (Daubenmire 1968). This paper presents one technique to aid nurserymen and others in selecting quality seedlings with the longest root systems from nursery stock.

METHODS AND MATERIALS

Seeds from the same source were stratified for 150 days at 4° C (39° F) on filter paper moistened with distilled water. After 150 days in stratification, enough seeds had germinated for use in the study.

Twenty-four glass tubes, each 122 cm (4 ft) in length and 6.4 cm (2.5 in) in diameter, were prepared; one end was closed with a rubber stopper equipped with a 6-mm (1/4-in) glass tube for drainage. A mixture of one part peat moss and three parts loamy soil, taken from an established mahogany stand, was evenly tamped into each of the 24 tubes filling them to within 2.5 cm (1 in) of the top. These were uniformly saturated with deionized water and kept at field capacity for the duration of the study.

The tubes were placed in a plant growth chamber in six rows of four each, supported and covered by a specially built light-tight box, and secured at a 45° angle. Two germinated seeds were planted in each tube. After emergence, plants were thinned to one per tube. Roots grew against the lower edge of the glass, permitting measurement of root extension. The growth chamber was programed to simulate typical springtime conditions. Temperature was held at 24° C (75° F) during a 14-hour light period and at 5° C (41° F) during a 10-hour dark period; humidity approximated 60 percent. When roots appeared on the underside of the tube, they were measured from the soil surface to root tip every 7 days for 112 days. At that time, 7 of 24 plants had reached tube bottoms.

Plants were extracted, and their root lengths were correlated with stem diameters. Stem diameters were measured just above the root crown with vernier calipers.

RESULTS AND DISCUSSION

Average root length after 112 days was 94.5 cm (37.2 in). Average stem diameter was 0.074 cm (0.029 in).

The relationship between root length and stem diameter was significant at the 0.001 level ($r = 0.8209$) (fig. 1). The gap in the data plotted in figure 1 from 0.065 cm (0.026 in) to 0.085 cm (0.034 in) occurred naturally in the sample.

Mountain-mahogany seedlings with the largest stem diameters tend to possess longer root systems 112 days after germination. Knowledge of this relationship will be advantageous to nurserymen thinning seed beds or selecting young seedlings for container stock and to scientists selecting seedlings for research. Even though lifting of seedlings may destroy some length of the root system, this relationship indicates general plant vigor; therefore, selection of seedlings with the largest stem diameter may increase survival after outplanting or potting. Although we tend to assume that the tallest and most robust plants have the best root system, we found an indication that top growth

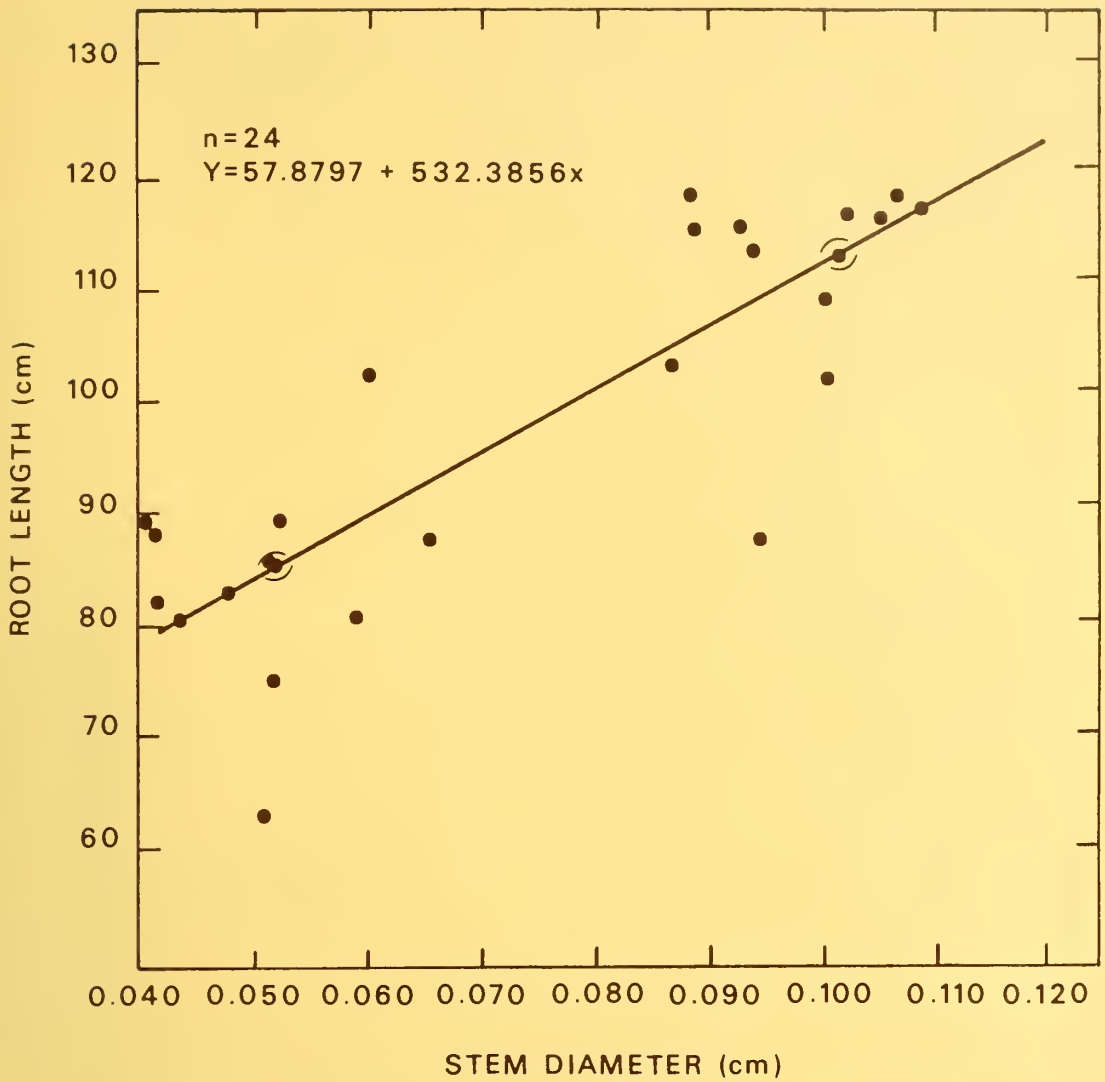

Figure 1.--Relationship between root length and stem diameter.

may even be sacrificed for root extension during the establishment phase. We observed that stems having the greatest diameter were not the tallest plants, but they did possess vigorous tops with large healthy leaves. Whether this root length/stem diameter relationship continues beyond 112 days is unknown.

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GPO 994-335